EXHIBIT C

Microsoft PDC 2000

Professional Developers Conference

the defining **point**

Best Available Copy

Application Center 2000: Ensuring Reliability/Availability of Web and Component Applications

Justin Grant
Lead Program Manager
Application Center

Agenda…

- Application Center 2000 overview
- Distributed Application Monitoring
- WMI: the infrastructure of management of Windows DNA and .NET
- Managing and guaranteeing application availability with Application Center
  - Performance Management
  - Event Management
  - Health Monitor for automated “lights-out” recovery from application or system failures

Scale-Out

- ☐ Software scale-out model works
  - ☐ Cost-effective using commodity hardware
  - ☐ Scalable by adding more servers
  - ☐ Highly reliable
- ☐ But…
  - ☐ Ongoing operational costs
  - ☐ Difficult to deploy apps
  - ☐ Difficult to monitor apps for proactive management
  - ☐ Difficult to test apps
- ☐ **Application Center 2000:**
  Lower cost & complexity of scale out

AC 2000: Functional Overview

- Simple *Application* Management
  - Single application image
  - Deployment and synchronization
- Software Scaling Made Easy
  - On-demand scalability
  - Integrated load balancing management
- Mission-Critical Availability
  - No single point of failure
  - Performance and health monitoring

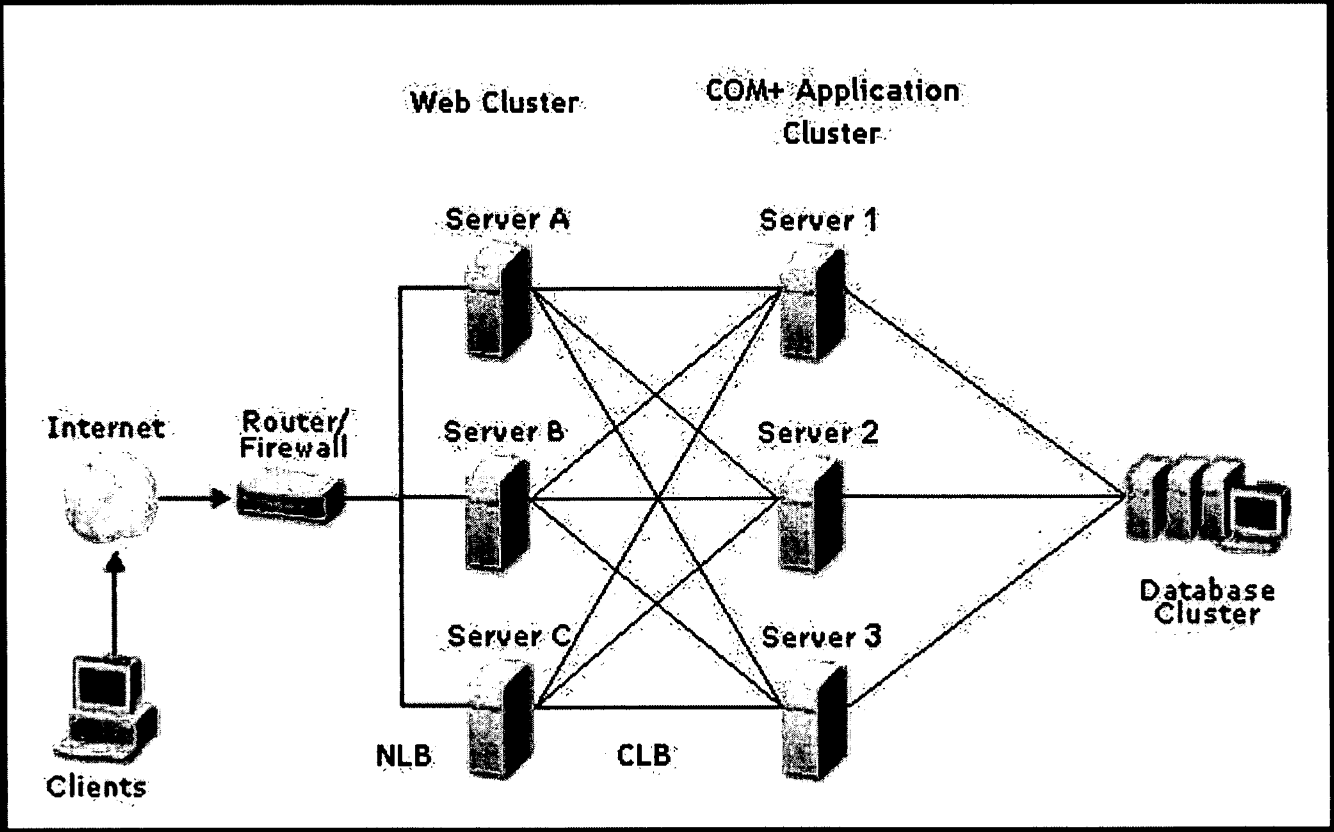
Platform Support

- ☐ WinDNA 2000
  - ☐ Win2K Server, Advanced, DataCenter
  - ☐ IIS 5, Active Server Pages (ASP)
  - ☐ COM+ 1.0
  - ☐ WMI
- ☐ .NET
  - ☐ Load Balancing for Web Services, ASP+ integrated with application-level monitoring
  - ☐ Richer instrumentation of .NET framework
  - ☐ Easier instrumentation of .NET applications
  - ☐ More integration with Application Center

Application Center Scenarios

- .COM's
- Hosting Providers & ASP's
- Intranet
- Web Services

Application Center Topology



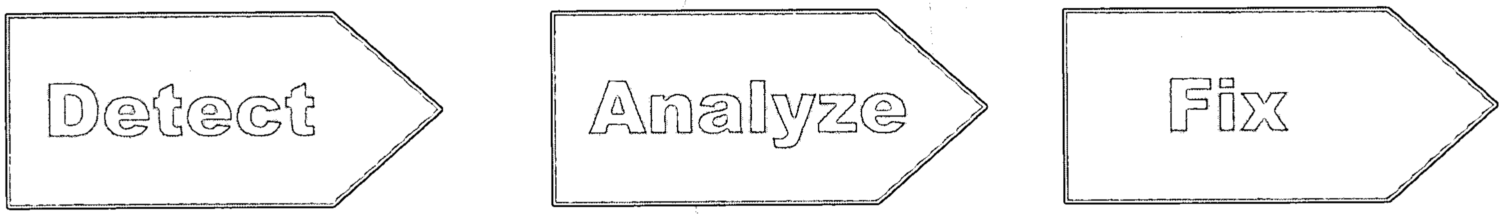
web tier + biz-logic tier + data tier

Application Center 2000: High-Availability Architecture

- ☐ "Shared Nothing" clusters
  - ☐ No single point of failure
  - ☐ Application availability not affected if Cluster Controller fails
  - ☐ Fault-tolerant load balancing protects users from server or application failures
- ☐ Local Monitoring
  - ☐ Every server monitors itself
  - ☐ If critical failure detected, server can remove itself from load balancing
- ☐ Remote Monitoring
  - ☐ Rich application-level (HTTP,TCP/IP,etc.) and network level (ICMP,SNMP,etc.) remote monitoring

Monitoring For Availability

Goal: Customers can access your site

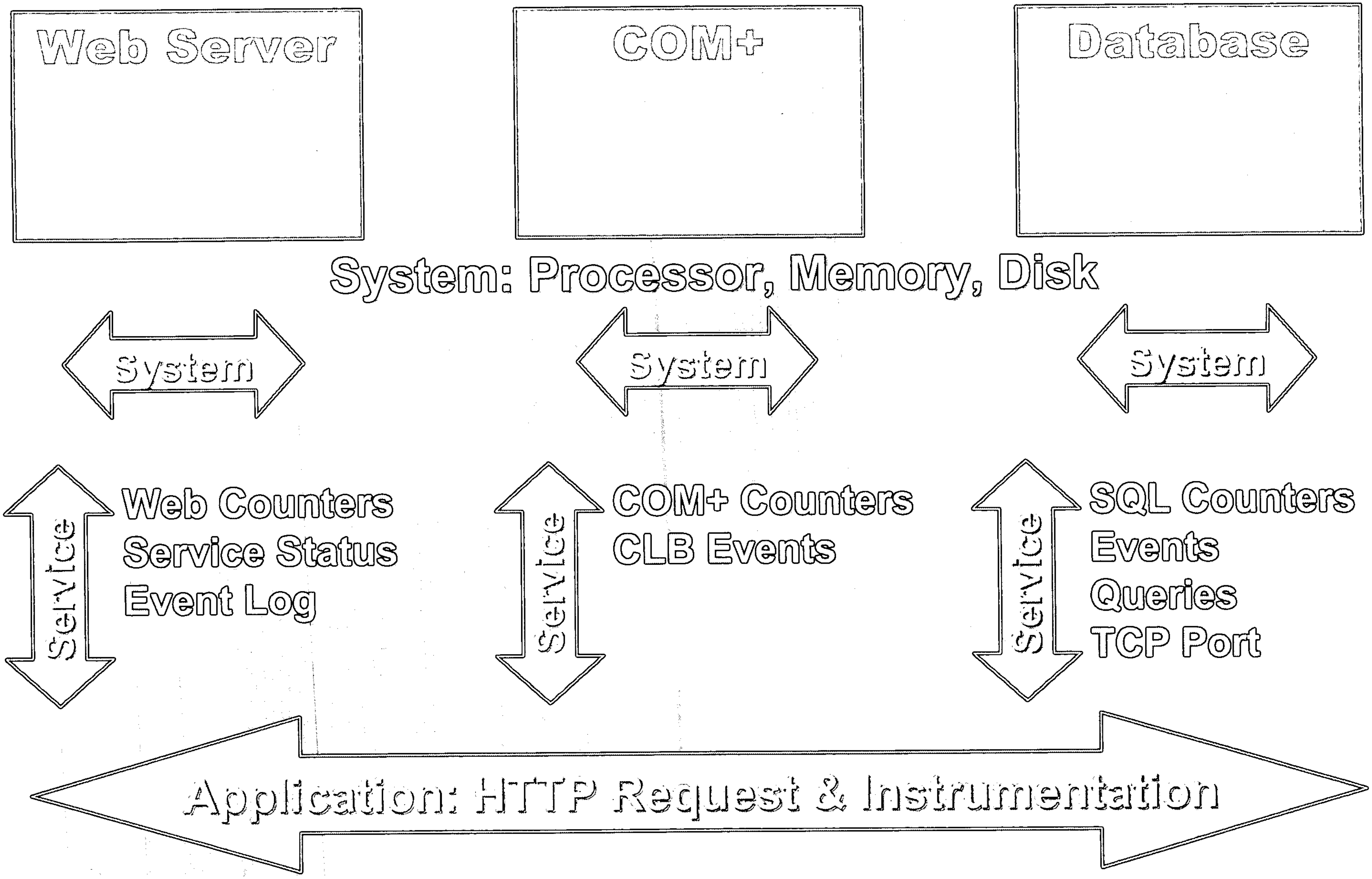

Detect

Analyze

Fix

WMI + Application Center

Monitoring Health



Web Server

COM+

Database

System: Processor, Memory, Disk

System

System

System

Service

Web Counters
Service Status
Event Log

Service

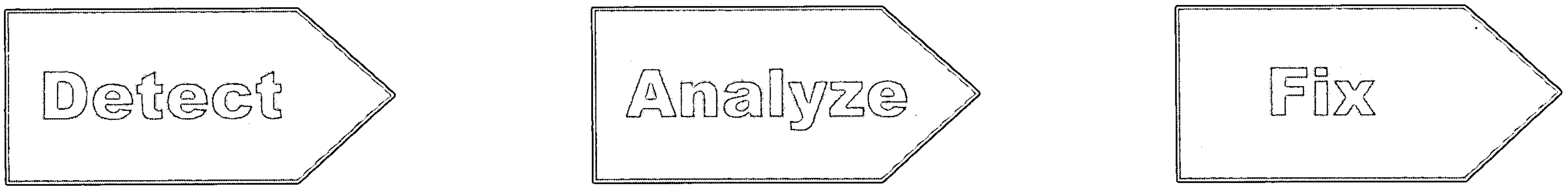
COM+ Counters
CLB Events

Service

SQL Counters
Events
Queries
TCP Port

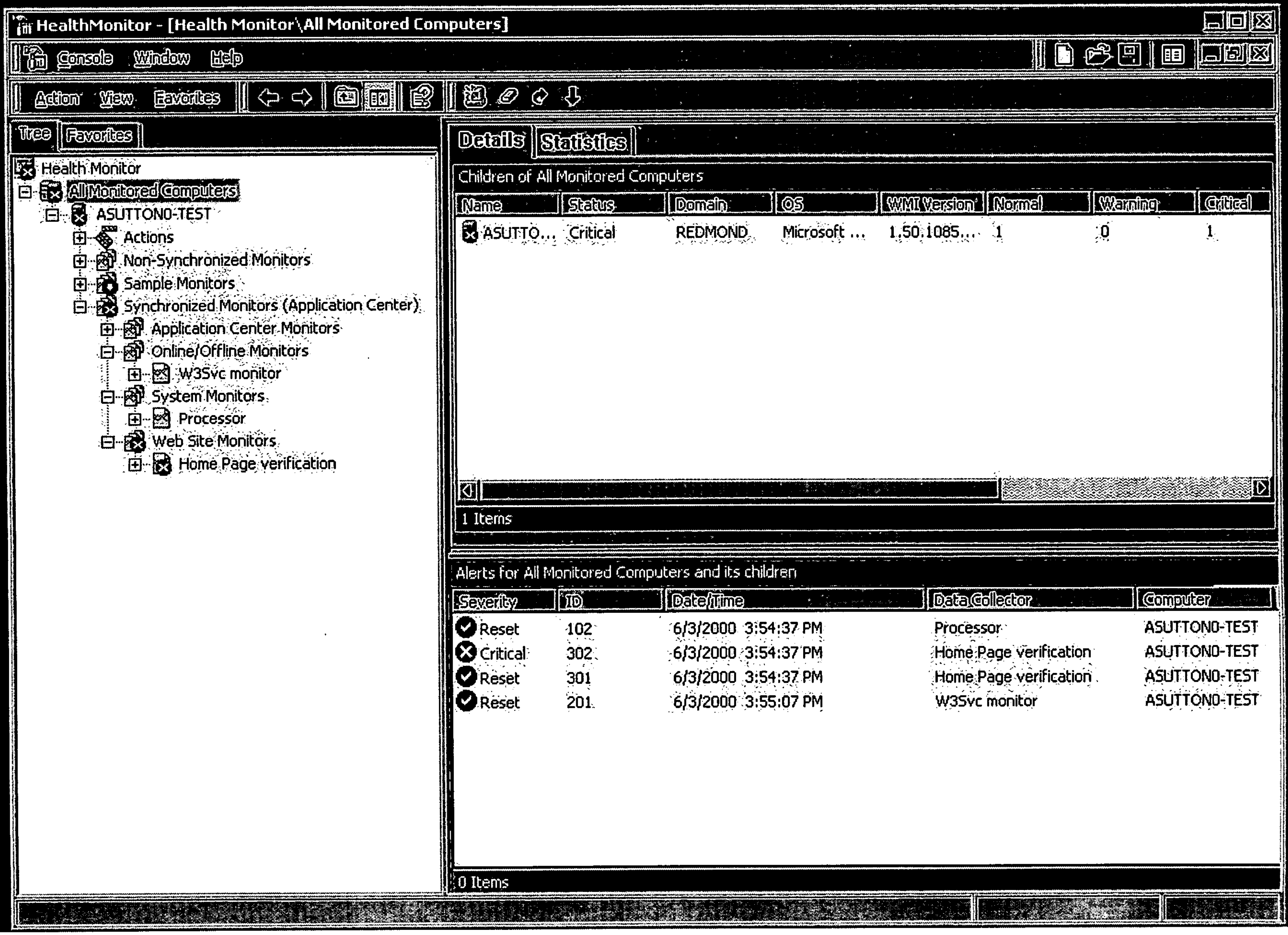
Application: HTTP Request & Instrumentation

Demo: System Health



- Create monitor for CPU overload
- Associate action
- Generate CPU load
- Health Monitor console
- E-mail to administrator

Using Health Monitor



- Health Monitor
  - All Monitored Computers
    - ASUTTON0-TEST
      - Actions
      - Non-Synchronized Monitors
      - Sample Monitors
      - Synchronized Monitors (Application Center)
        - Application Center Monitors
        - Online/Offline Monitors
          - W3Svc monitor
        - System Monitors
          - Processor
        - Web Site Monitors
          - Home Page verification

Children of All Monitored Computers

Name	Status	Domain	OS	WMI Version	Normal	Warning	Critical
ASUTTO...	Critical	REDMOND	Microsoft ...	1.50.1085...	1	0	1

1 Items

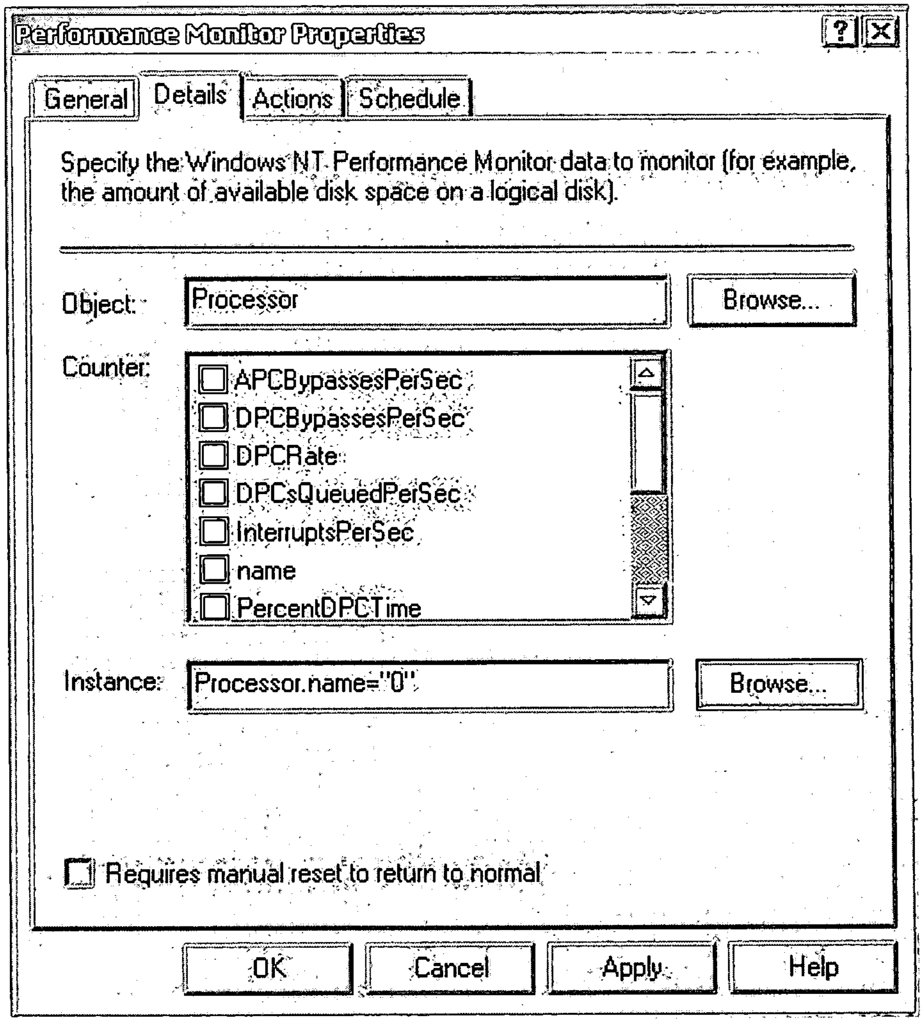
Alerts for All Monitored Computers and its children

Severity	ID	Date/Time	Data Collector	Computer
✓ Reset	102	6/3/2000 3:54:37 PM	Processor	ASUTTON0-TEST
☒ Critical	302	6/3/2000 3:54:37 PM	Home Page verification	ASUTTON0-TEST
✓ Reset	301	6/3/2000 3:54:37 PM	Home Page verification	ASUTTON0-TEST
✓ Reset	201	6/3/2000 3:55:07 PM	W3Svc monitor	ASUTTON0-TEST

0 Items

Data Collectors

- ☐ Perf counter
- ☐ Event Log
- ☐ Service/Process
- ☐ COM+ Application
- ☐ HTTP requests
- ☐ File or Directory
- ☐ Ping
- ☐ TCP/IP port connect
- ☐ WMI instance, event and data queries



Performance Monitor Properties

Specify the Windows NT Performance Monitor data to monitor (for example, the amount of available disk space on a logical disk).

Object: Processor

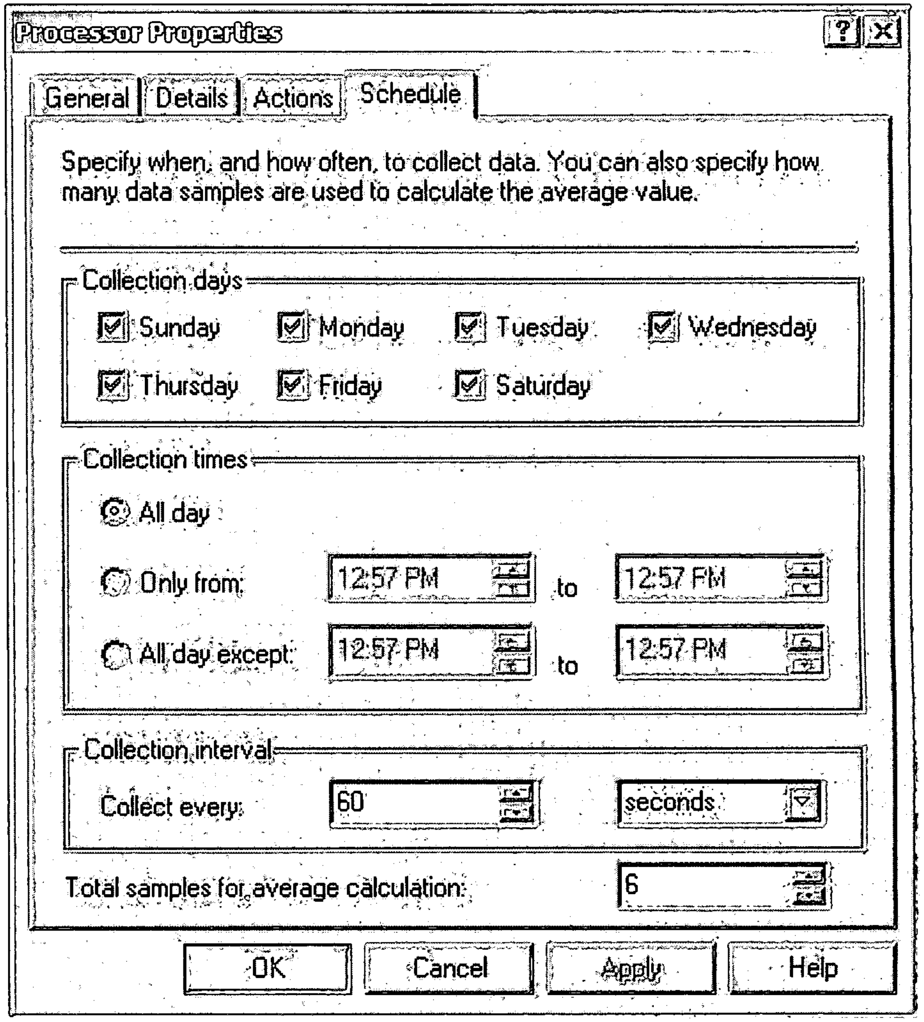
Counter:
- ☐ APCBypassesPerSec
- ☐ DPCBypassesPerSec
- ☐ DPCRate
- ☐ DPCsQueuedPerSec
- ☐ InterruptsPerSec
- ☐ name
- ☐ PercentDPCTime

Instance: Processor.name="0"

☐ Requires manual reset to return to normal

Schedule

- Collection Times
- Interval
- Average



Specify when, and how often, to collect data. You can also specify how many data samples are used to calculate the average value.

Collection days

☑ Sunday ☑ Monday ☑ Tuesday ☑ Wednesday

☑ Thursday ☑ Friday ☑ Saturday

Collection times

● All day

○ Only from: 12:57 PM to 12:57 PM

○ All day except: 12:57 PM to 12:57 PM

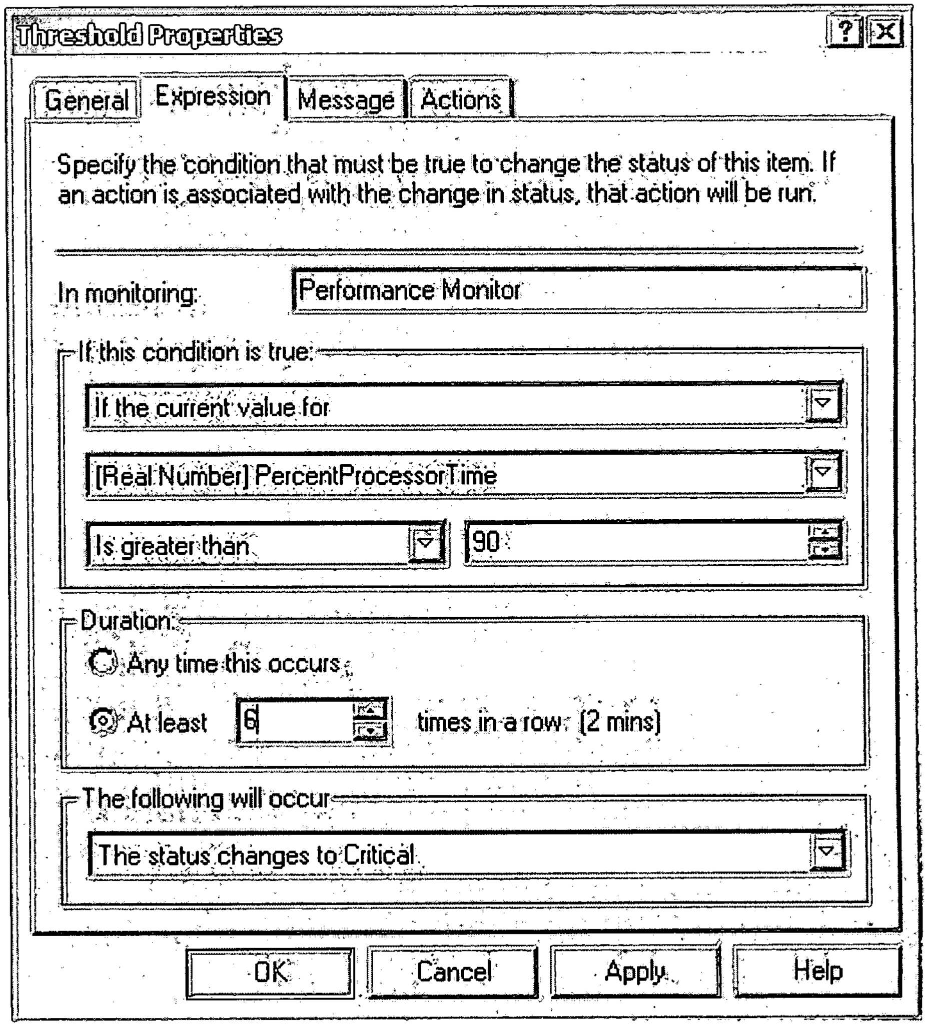
Collection interval

Collect every: 60 seconds

Total samples for average calculation: 6

Thresholds

- ☐ Single property
- ☐ Current value, average, change
- ☐ Single or multiple occurrences
- ☐ State change
- ☐ Fires WMI Event



Specify the condition that must be true to change the status of this item. If an action is associated with the change in status, that action will be run.

In monitoring: Performance Monitor

If this condition is true:

If the current value for

[Real Number] PercentProcessorTime

Is greater than 90

Duration:

○ Any time this occurs

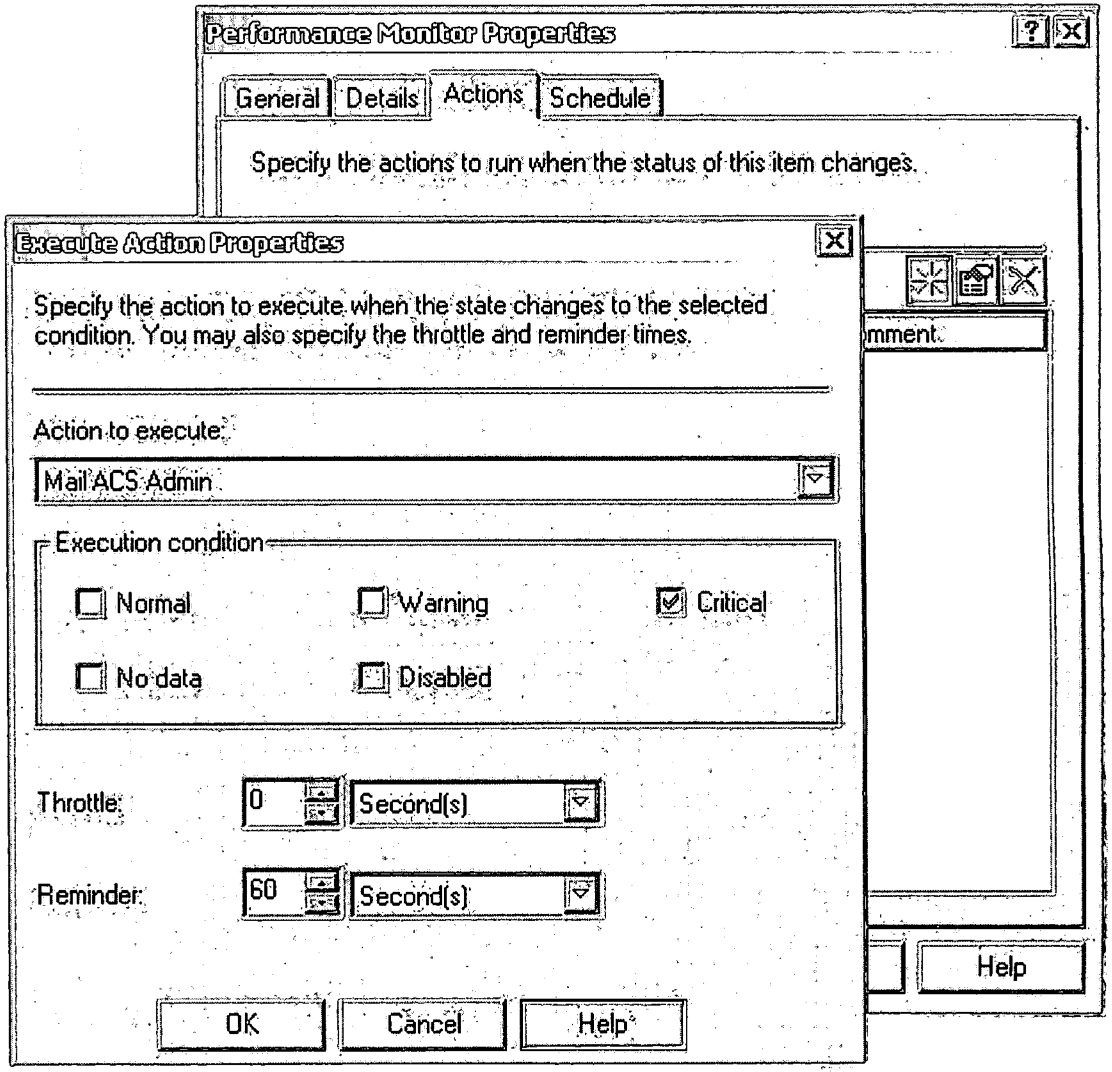
● At least 6 times in a row. (2 mins)

The following will occur

The status changes to Critical

Actions

- E-Mail
- Text log
- Windows log
- Command line
- Script



Performance Monitor Properties

Specify the actions to run when the status of this item changes.

Execute Action Properties

Specify the action to execute when the state changes to the selected condition. You may also specify the throttle and reminder times.

Action to execute: Mail ACS Admin

Execution condition

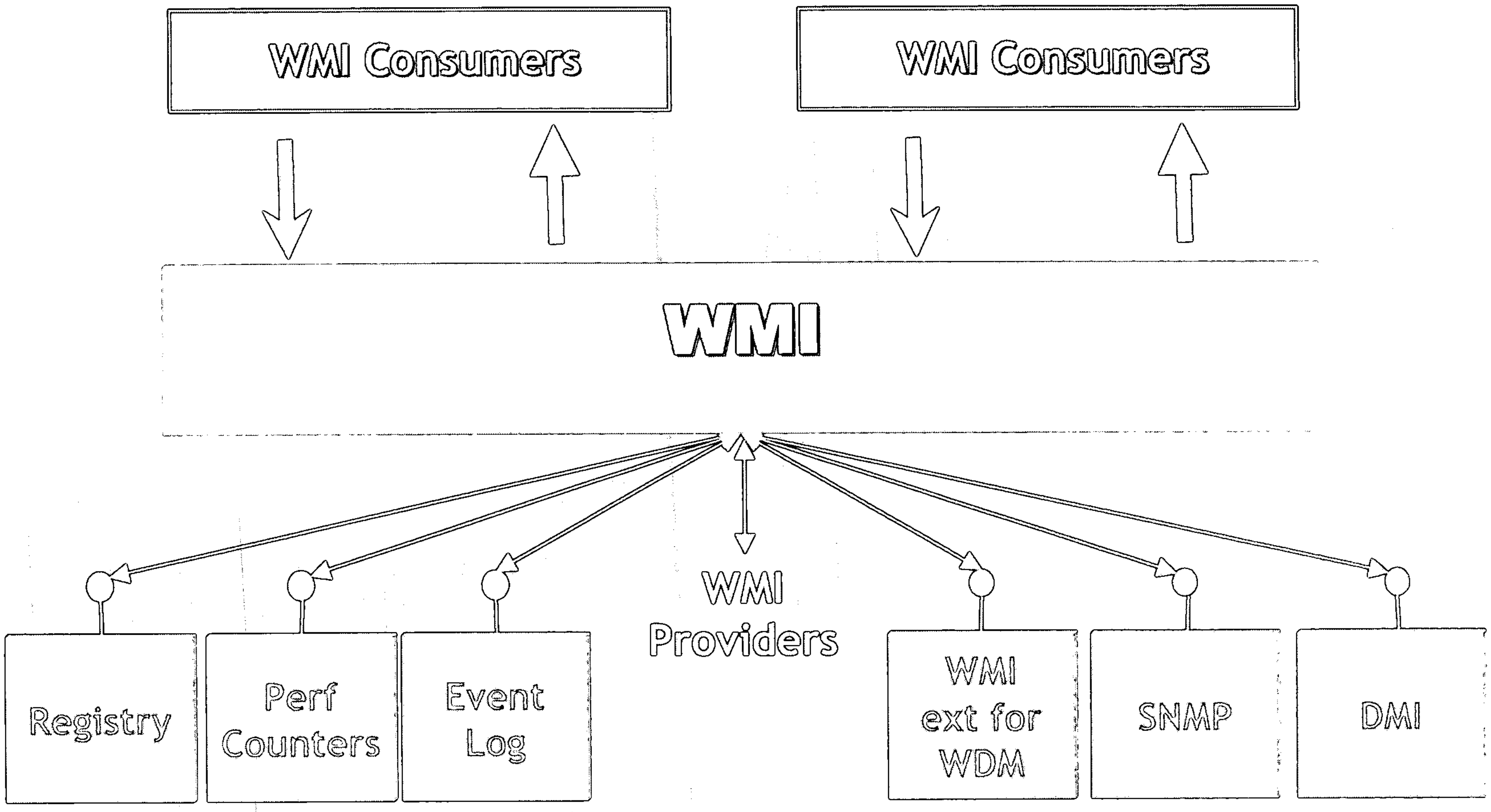
☐ Normal ☐ Warning ☑ Critical

☐ No data ☐ Disabled

Throttle: 0 Second(s)

Reminder: 60 Second(s)

WMI Overview



WMI Consumers

WMI Consumers

WMI

WMI Providers

Registry

Perf Counters

Event Log

WMI ext for WDM

SNMP

DMI

WMI Queries

All CIM objects are queryable

```
IWbemServices::ExecQuery
   (“select * from Win32LogicalDisk
        where Win32LogicalDisk.FreeSpace < 2000000”)
```

SQL subset w/ new terms

Extensions for Discovery/Traversal of Schema relationships

```
IWbemServices::ExecQuery
   (“Associators of  {Win32_Service = ‘DHCP’})
```

Event filtering (thresholds, aggregation, inheritance)

`within` XXX -- for specifying the tolerance for event delay

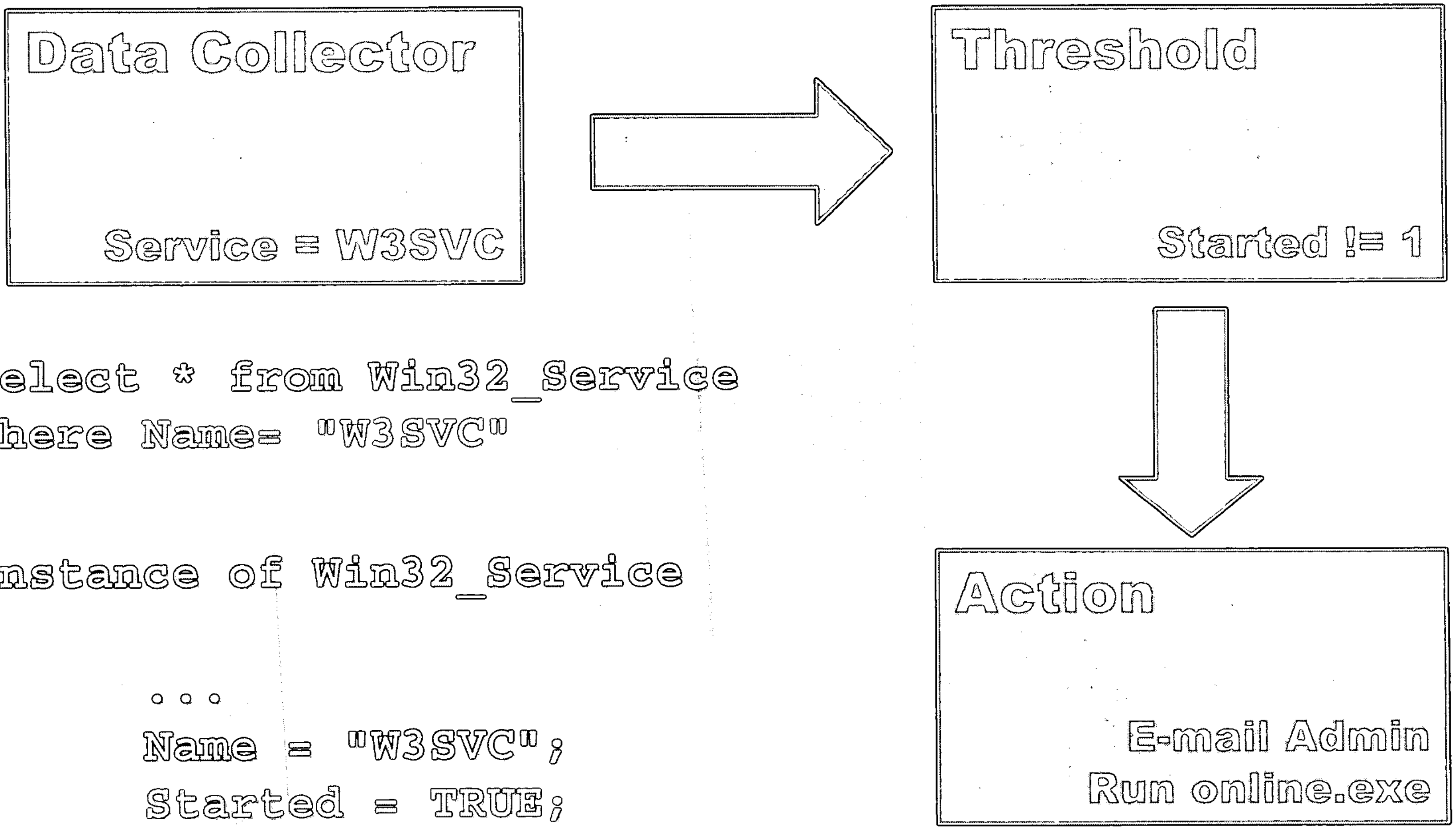
`isa` -- registration applies to all events from class (incl. derived classes)

`within` XXX (within <u>group by</u> clause) -- specifies aggregation interval

```
select * from __InstanceModificationEvent within 5
where TargetInstance isa Win32_LogicalDisk
group by DriveLetter
within 10 having count > 25
```

Tip: use `wbemtest` or `CIM Studio`

Health Monitor Data Flow



Data Collector

Service = W3SVC

Threshold

Started != 1

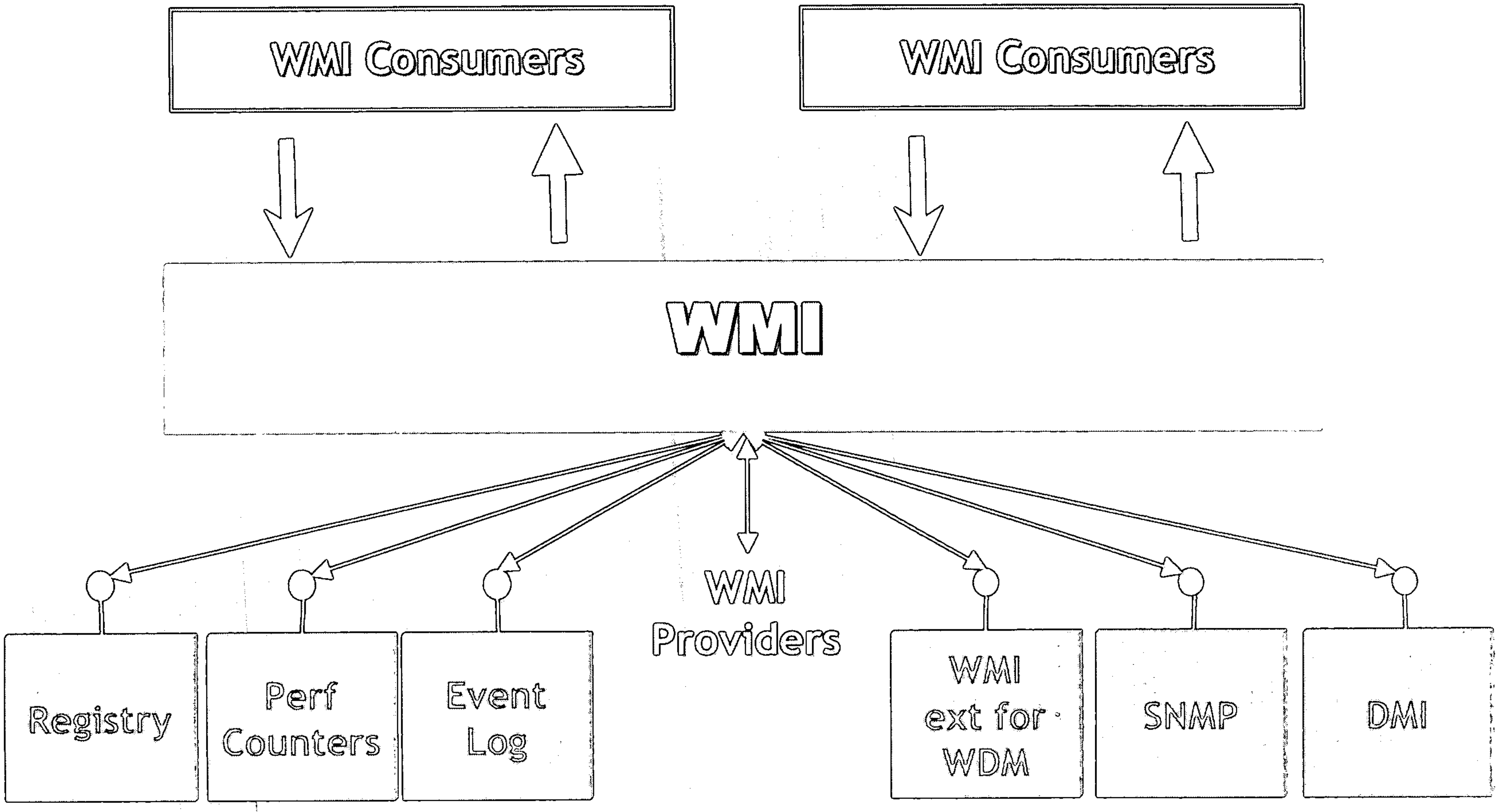
Action

E-mail Admin
Run online.exe

```
Select * from Win32_Service
where Name= "W3SVC"


instance of Win32_Service
{
      . . .
      Name = "W3SVC";
      Started = TRUE;
      State = "Running";
      . . .
};
```

WMI Overview



WMI Consumers

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WMI

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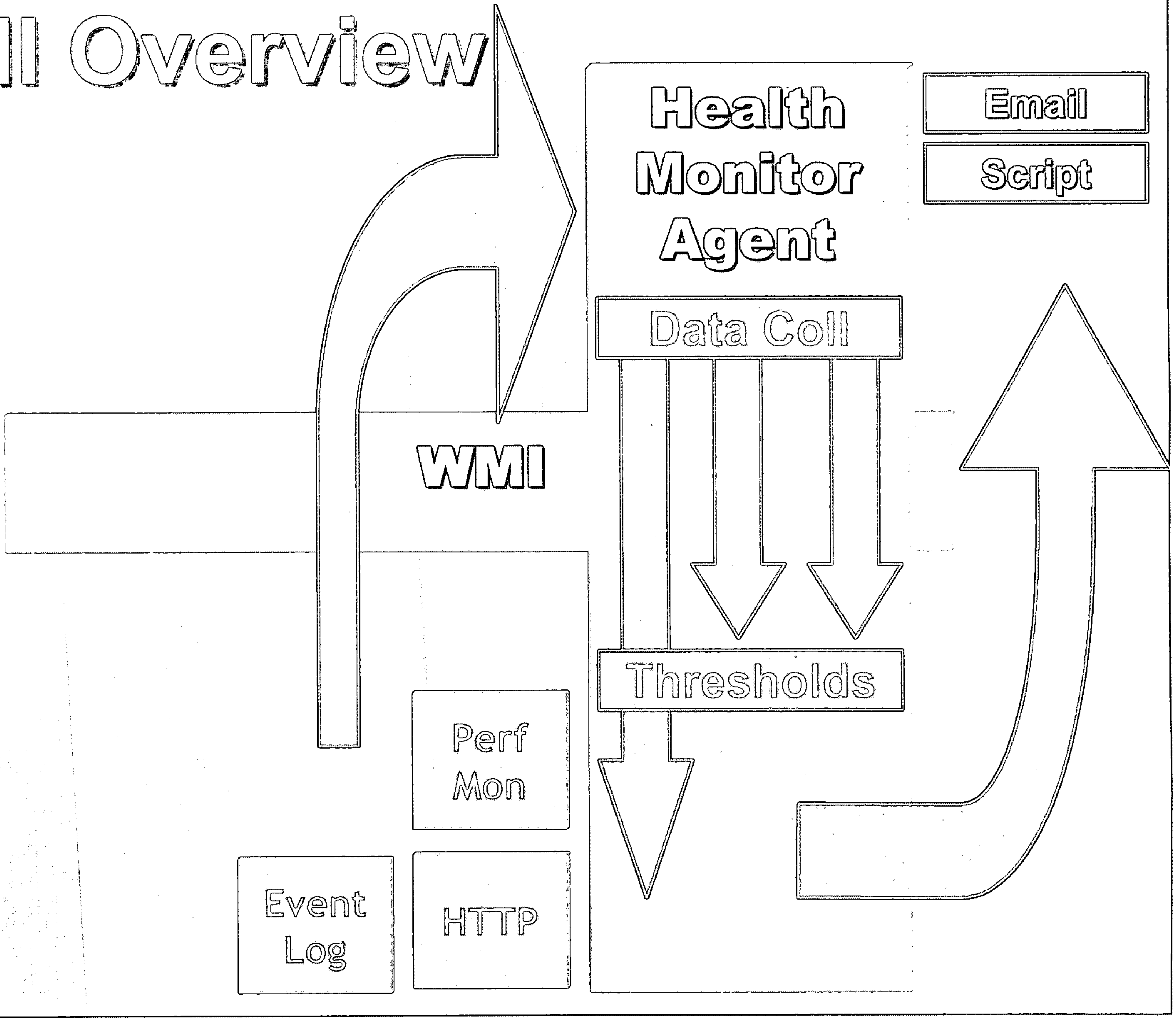
WMI Overview



WMI

Health Monitor Agent

Data Coll

Thresholds

Email

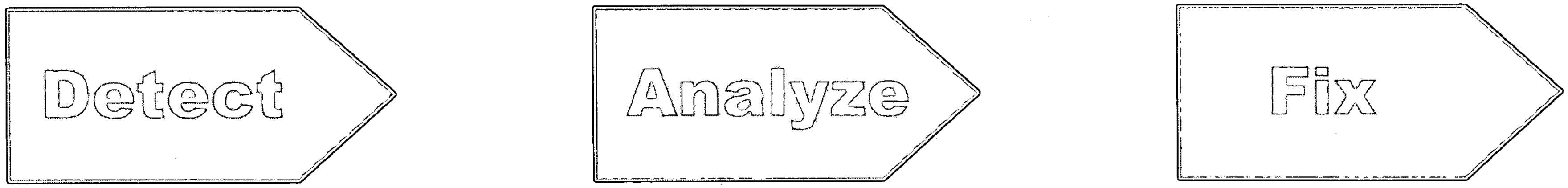
Script

Perf Mon

HTTP

Event Log

Demo: System Health

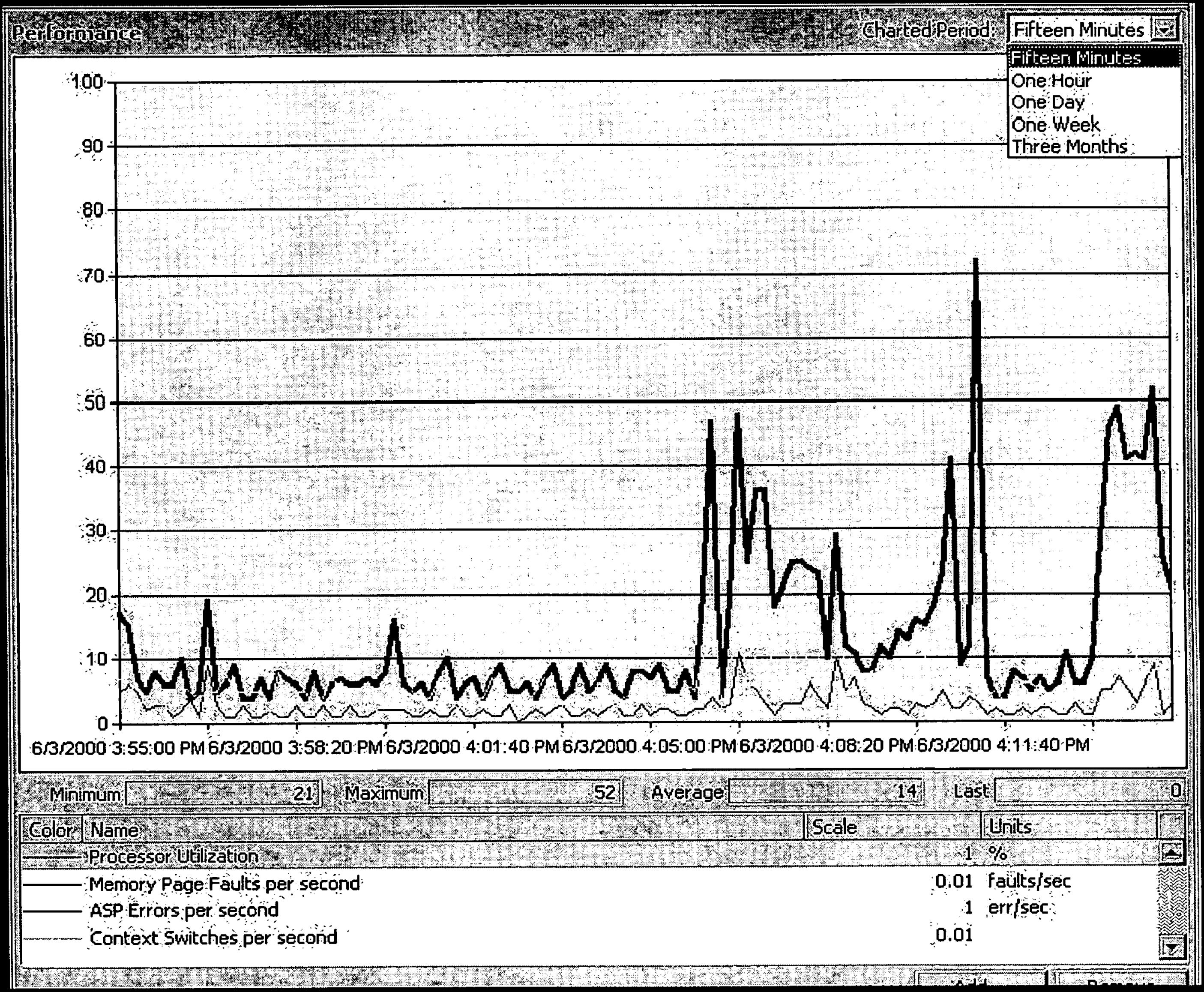

Detect

Analyze

Fix

- ☐ Monitor for CPU spikes
- ☐ Generate CPU load
- ☐ Application Center Perf Viewer
- ☐ Application Center Event Viewer
- ☐ Application Center Monitor Viewer

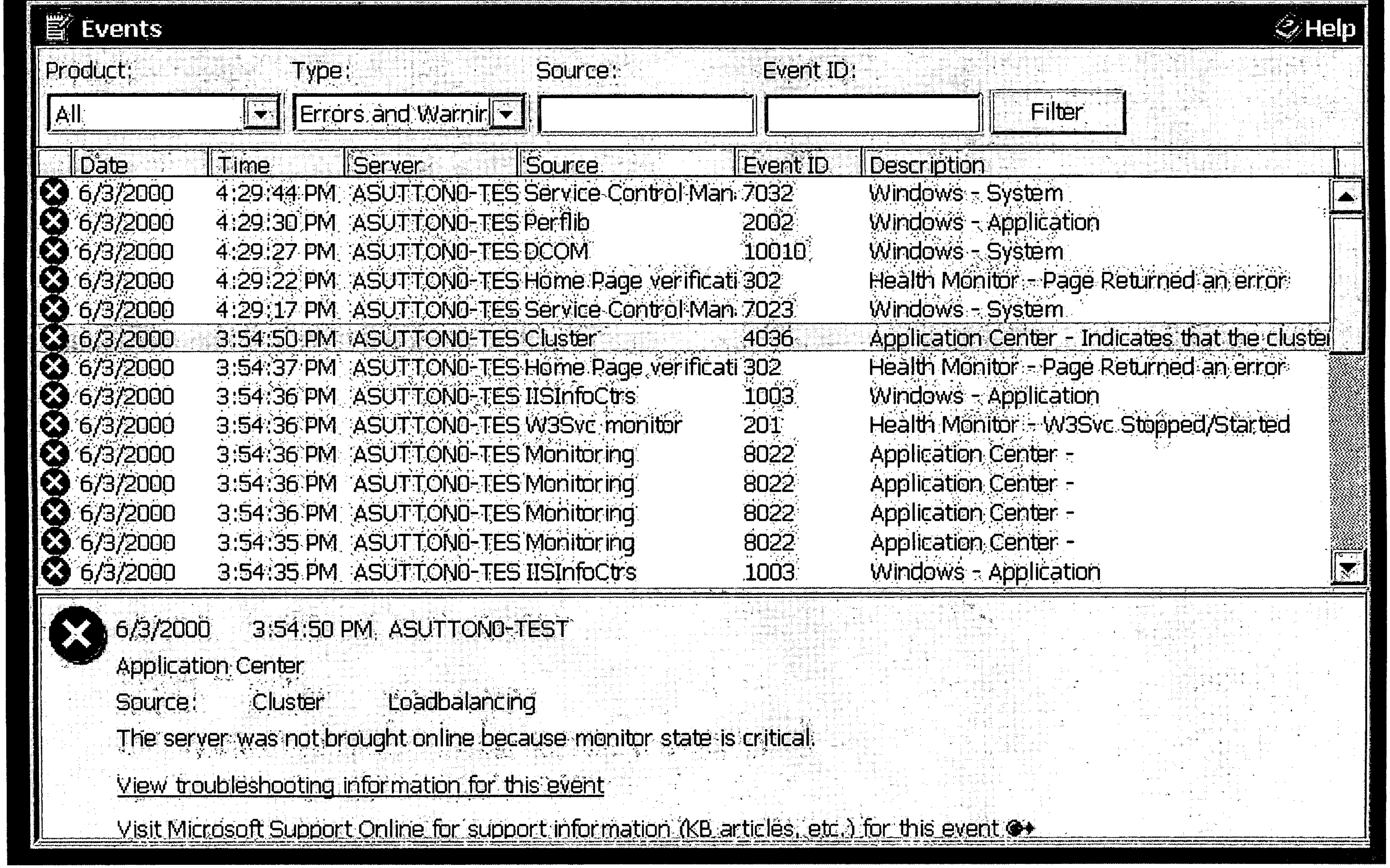
Performance Counters



Minimum 21 Maximum 52 Average 14 Last 0

Color	Name	Scale	Units
	Processor Utilization	1	%
	Memory Page Faults per second	0.01	faults/sec
	ASP Errors per second	1	err/sec
	Context Switches per second	0.01	

Unified Event Log



Product: All
Type: Errors and Warnir
Source:
Event ID:

	Date	Time	Server	Source	Event ID	Description
☒	6/3/2000	4:29:44 PM	ASUTTON0-TES	Service Control Man	7032	Windows - System
☒	6/3/2000	4:29:30 PM	ASUTTON0-TES	Perflib	2002	Windows - Application
☒	6/3/2000	4:29:27 PM	ASUTTON0-TES	DCOM	10010	Windows - System
☒	6/3/2000	4:29:22 PM	ASUTTON0-TES	Home Page verificati	302	Health Monitor - Page Returned an error
☒	6/3/2000	4:29:17 PM	ASUTTON0-TES	Service Control Man	7023	Windows - System
☒	6/3/2000	3:54:50 PM	ASUTTON0-TES	Cluster	4036	Application Center - Indicates that the cluste
☒	6/3/2000	3:54:37 PM	ASUTTON0-TES	Home Page verificati	302	Health Monitor - Page Returned an error
☒	6/3/2000	3:54:36 PM	ASUTTON0-TES	IISInfoCtrs	1003	Windows - Application
☒	6/3/2000	3:54:36 PM	ASUTTON0-TES	W3Svc monitor	201	Health Monitor - W3Svc Stopped/Started
☒	6/3/2000	3:54:36 PM	ASUTTON0-TES	Monitoring	8022	Application Center -
☒	6/3/2000	3:54:36 PM	ASUTTON0-TES	Monitoring	8022	Application Center -
☒	6/3/2000	3:54:36 PM	ASUTTON0-TES	Monitoring	8022	Application Center -
☒	6/3/2000	3:54:35 PM	ASUTTON0-TES	Monitoring	8022	Application Center -
☒	6/3/2000	3:54:35 PM	ASUTTON0-TES	IISInfoCtrs	1003	Windows - Application

6/3/2000 3:54:50 PM ASUTTON0-TEST

Application Center

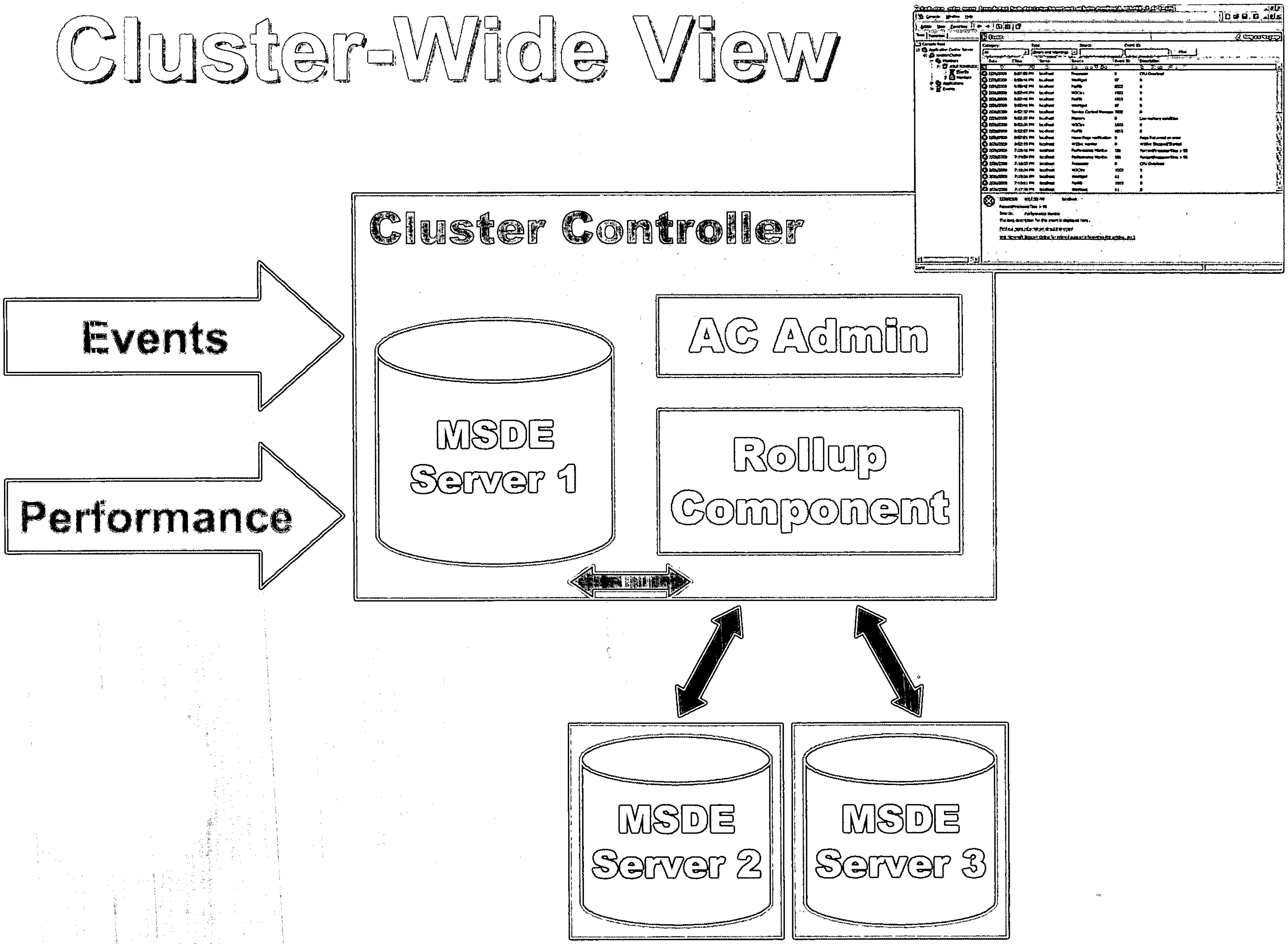
Source: Cluster Loadbalancing

The server was not brought online because monitor state is critical.

View troubleshooting information for this event

Visit Microsoft Support Online for support information (KB articles, etc.) for this event

Cluster-Wide View



Events

Performance

Cluster Controller

MSDE Server 1

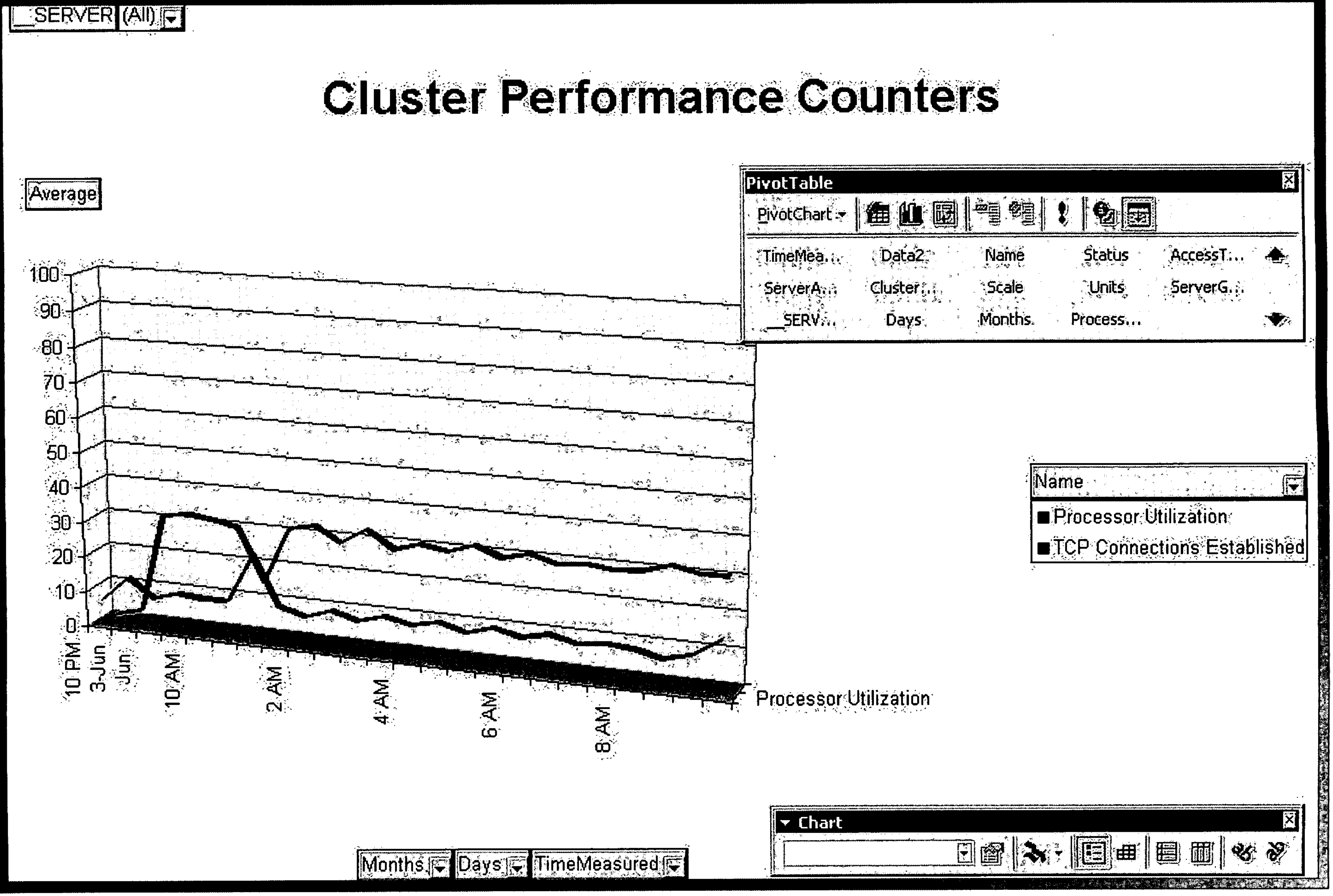
AC Admin

Rollup Component

MSDE Server 2

MSDE Server 3

Log Access Possibilities



Monitoring Extensibility

- Application Center WMI Provider
- Extract Application Center logs
- Query and reporting tools
- 3rd party monitoring tools
- WMI event consumer

Demo: Application Availability

Detect

Analyze

Fix

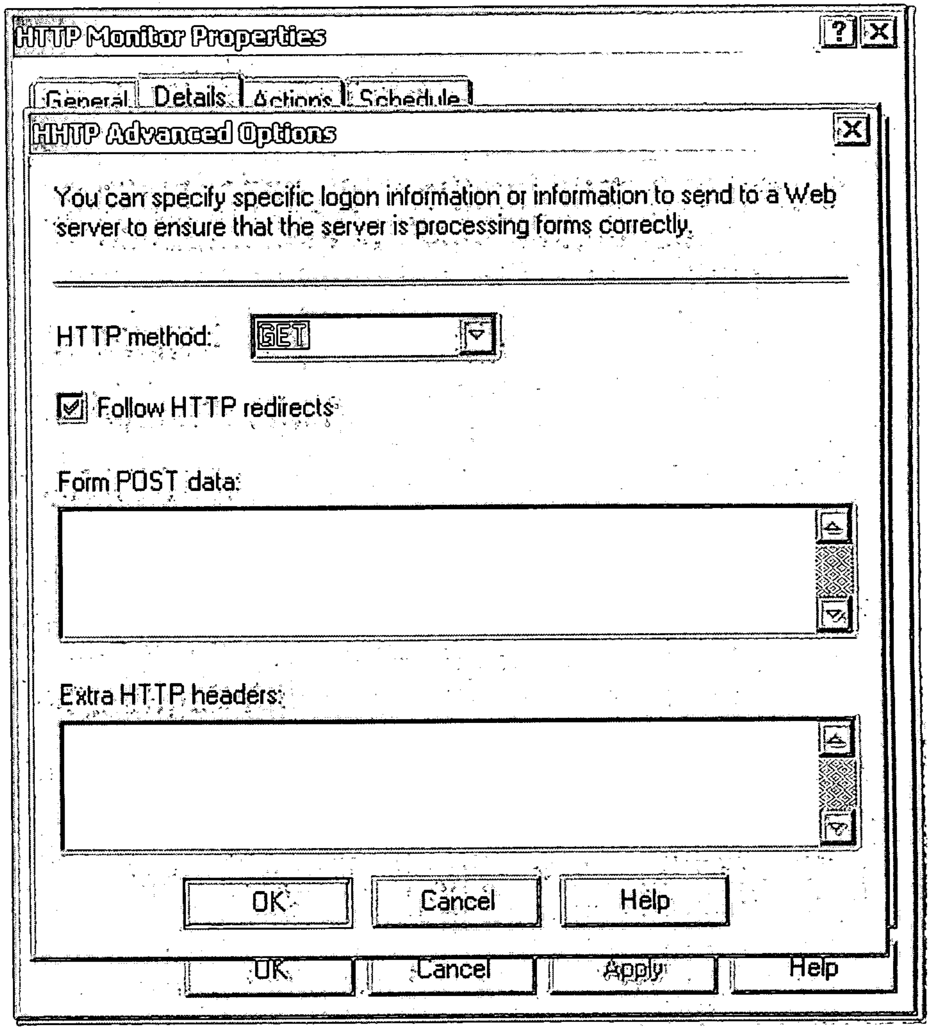
- Create HTTP Monitor
- Web Service Monitor
- Associate Action
- Stop web service on member
- Monitors fail and state goes critical
- Action takes server offline
- E-mail admin and alert in event log

Application Availability

- Monitors can control load balancing
  - If monitor fails, server goes offline
  - Default Application Center rule
- Scriptable to extend behavior
- Beware taking all servers offline
  - Redirect page if database error
  - Or custom scripts

Web Page Monitors

- URL
- Timeout
- Authentication
- HTTP Method
- Post Data
- Custom Headers



You can specify specific logon information or information to send to a Web server to ensure that the server is processing forms correctly.

HTTP method: GET

☑ Follow HTTP redirects

Form POST data:

Extra HTTP headers:

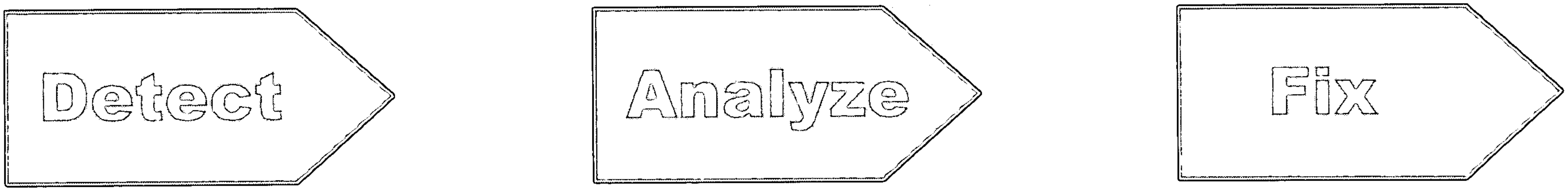
Web Page Monitors

- Response Properties
  - Status code, response time, last modified
  - Text response, binary response, headers
  - Content length, received bytes
- Actions
  - Take offline
  - Redirect to a different page
  - Check other monitors
  - Run a script

Database Monitors

- Database health
  - Performance Counters and Events
  - SQL DMO Provider
- Connectivity to the server
  - TCP/IP port connect
- Successful query
  - ASP page

Database Monitoring Script



Detect

Analyze

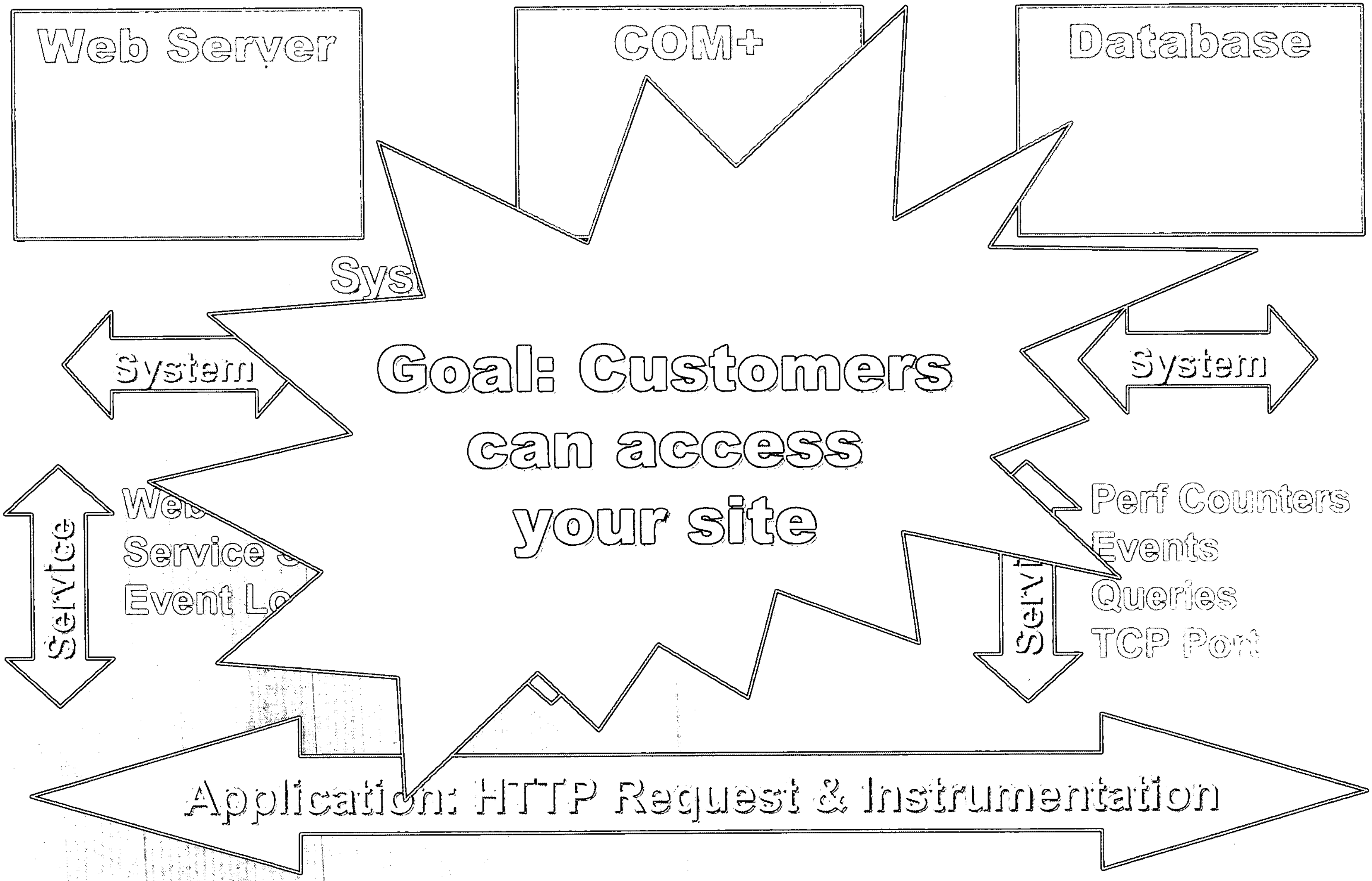
Fix

- Demo ASP database monitor

COM+ Statistics Provider

- Execution metrics
  - Total committed transactions and per sec
  - Total aborted transactions and per sec
  - Total object creations and per sec
  - Total object activations and per sec
  - Shutdowns: total, timeout, admin, failure
  - Object pool timeouts
- Win32_Process statistics (dllhost.exe)
  - Handles, working set, page faults, processor time...

Monitoring Health



Web Server

COM+

Database

Sys

System

System

Goal: Customers can access your site

Service

Web

Service S

Event Lo

Servi

Perf Counters
Events
Queries
TCP Port

Application: HTTP Request & Instrumentation

Application Center Monitoring

- Health Monitor Integration
    - Monitoring samples
    - Load balancing control
    - Replication of monitors and time
    - Operators view
- Cluster-wide event log
- Cluster-wide performance counters

Best Practices

Detect

Analyze

Fix

- Instrumentation
  - HTTP, ping and port connect monitors
  - PerfMon and Event Log
  - WMI Provider
- Monitor application health
  - What does availability mean to you?
  - Baseline performance
  - Watch out for false positives

Call to Action

- Install Application Center Beta 1 !
- Monitor and instrument your applications
- Develop an operations plan
- Understand WMI

Related Sessions And References

- Other PDC sessions recommended
  - *Load-Balancing .NET Platform Applications with Application Center 2000*
    (2-315, Room 311, 9/12/00, 2:45 p.m. Ori Amiga)
  - *Using WMI to Build Management into .NET Platform Applications*
    (3-344, Room 304, 9/12/00, 2:45 p.m. Corina Feuerstein; Travis Muhlestein; Stephen Todd)
  - *Scaling out the Data Tier with Shared Nothing Clustering Technology in SQL Server 2000 and Beyond*
    (2-328, Room 109, 9/13/00, 5:30 p.m., Pedro Celis)
- References
  - http://www.microsoft.com/applicationcenter
  - WMI Reference: Platform SDK, Management Services

Where do you want to go today?

Microsoft